Appendix A

5 DEFINITIONS OF VARIABLES

5.1 STATISTICAL MEASURES

Averages:

Arithmetic mean: $\sum_k D_k / N$ Average diameter of all the particles in the sample.

Surface mean: $[\sum_k D_k^2 / N]^{1/2}$ The diameter of a particle whose surface area, if multiplied by the total number of particles, will equal the total surface area of the sample.

Volume mean: $[\sum_k D_k^3 / N]^{1/3}$ The diameter of a particle whose volume, if multiplied by the total number of particles, equals the total volume of the sample.

Sauter mean: $\sum_k D_k^3 / \sum_k D_k^2$ The diameter of a particle whose ratio of volume to surface area is the same as the complete sample.

Sample size check: $\sum_k Dmax^3 / \sum_k D_k^3$ Fraction of the total volume represented by the largest particle.

Percentiles:

DVXX : the XXth percentile by volume. It is computed as the diameter such that the collection of particles having that size or less represents XX % of the total volume. The commonly used ones are DV10, DV50 and DV90.

DV50 is also called the **volume median**. It is the diameter that divides the sample into two equal halves, by mass or volume.

Measures of spread:

Deviation:
$$\frac{\sum [\,[D_{v0.5} - (D_{klb} + D_{kub})] / 2\,]\, N_k}{\sum_k N_k D_{v0.5}}$$
klb = lower bound of bin k
kub = upper bound of bin k

Relative span:
$$\frac{D_{v0.9} - D_{v0.1}}{D_{v0.5}}$$

Sphericity: a value from 0 to 1, with 1 representing a perfect circle. Computed as Da / Dp, where Da = square root (4 A / π), Dp = P / π ; A = pixel area, P = pixel perimeter.